

REMARKS

Rejections Under 35 USC §112

Claim 116 has been rejected under 35 USC §112, second paragraph, due to the limitation "the sealing layer" having insufficient antecedent basis. In response claim 116 has been amended to depend on claim 115 which provides antecedent basis for the limitation.

Rejections Under 35 USC §103

Claims 114, 117, 120 and 129 have been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156).

Claims 115, 121, 123-125, 128 and 130-131 have been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) as applied to claims 114 and 117 and further in view of Wakabayashi (US Patent No. 6,607,970).

Claim 116 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) as applied to claim 114 and further in view of Advanced Coating.

Claim 118 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) as applied to claim 114 and further in view of Nikkel (US 2002/0097302).

Claim 119 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) as applied to claim 114 and further in view of Chiang (US Patent No. 6,774,659).

Claim 122 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) and Wakabayahi (US Patent No. 6,607,970) as applied to claim 121 and further in view of Saitoh (US Patent No. 6,060,373).

Claims 126-127 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) and Wakabayahi (US Patent No. 6,607,970) as applied to claim 121 and further in view of Nikkel (US 2002/0097302).

Claims 132-133 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) and Wakabayahi (US Patent No. 6,607,970) as applied to claims 129-130 and further in view of Easton (US 2001/0040117).

Claim 134 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) and Wakabayahi (US Patent No. 6,607,970) as applied to claims 129 and further in view of Chien (US 2002/0009826).

Claim 134 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) and Wakabayahi (US Patent No. 6,607,970) as applied to claims 129 and further in view of Tani et al. (US Patent No. 6,080,602).

Claim 134 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Wang et al. (US Patent No. 6,573,156) and Wakabayahi (US Patent No. 6,607,970) as applied to claims 129 and further in view of Chen et al. (US Patent No. 6,221,751).

Claims 137-141 has been rejected under 35 USC §103(a) as being unpatentable over Shinogi et al. (US Patent No. 6,534,387) in view of Chien (US 2002/0009826).

The rejections under 35 USC §103(a) are traversed for the reasons to follow.

Allowed Claims

Claims 142-151 have been allowed.

In the allowed claims, independent claim 142 has been amended to correct an informality.

35 USC §103 Rejections of Claims 114-128

Claims 114-128 are directed to a method for fabricating semiconductor components 16E (Figure 13F).

As shown in Figure 13A, the method includes the step of providing a plurality of semiconductor dice 14E with die contacts 18E on a substrate 12E. As shown in Figure 13B, the method includes the step of forming contact bumps 24E on the die contacts 18E, and the step of forming an etch mask 84E on a back side of the substrate 12E. The etch mask 84E includes slots 86E in a criss cross pattern matching the peripheral outlines of the dice 14E. As shown in Figure 13C, the method also includes the step of forming a circuit side polymer layer 36E on the contact bumps 24E, which also has slots 88E in a criss cross pattern matching the peripheral outlines of the dice 14E. As shown in Figure 13D, the method also includes the step of planarizing the contact bumps 24E and the circuit side polymer layer 36E. As shown in Figure 13E, the method also includes the step of etching the substrate 12E from the circuit side 20E using the polymer layer 36E, and from the back side 22E using the etch mask 84E, to singulate the dice 14E. As shown in Figure 13F, the method also includes the step of removing the etch mask 84E, and forming a sealing layer 90E, such as parylene, on the singulated dice 14E.

1. Combination of references does not disclose all of the claims limitations

For a prima facie case of obviousness under 35 USC §103(a), MPEP 2142 requires that a combination of references must teach or suggest all the claim limitations. However, independent claims 114 and 121 have been amended to include additional recitations which further distinguish the claimed method from the cited combination and the prior art.

As shown in Figure 13E, with the method of claims 114-128, the substrate 12E is etched from both the circuit side 20E (first side) and the back side 22E (second side) at the same time. This forms first grooves 94E in the substrate 12E which correspond to the first slots 88E in the polymer layer 36E, and second grooves 92E in the substrate 12E which correspond to the second slots 86E in the mask 84E. In addition, the etching step is performed for a time period sufficient to singulate and define the edges of the dice 10E.

Amended independent claim 114 includes the recitation of "etching the substrate from the first side and the second side at a same time forming first grooves in the first side aligned with the first slots and second grooves in the second side aligned with the second slots for a time period sufficient to singulate the dice." Amended independent claim 121 includes similar recitations.

Antecedent basis for the "at a same time" recitation is contained on page 50, lines 16-17 of the specification. Antecedent basis for the "time period sufficient to singulate the dice" recitation is contained on page 50, lines 28-30 of the specification. Antecedent basis for the "first grooves" and "second grooves" recitations is contained on page 50, lines 18-24 of the specification.

In contrast, Shinogi et al. teaches forming grooves 21 using a dicing cutter (column 6, lines 26-29), forming a resin layer R in the grooves 21 (column 6, lines 38-39),

and then back grinding to the bottom of the grooves to singulate the dice 20A (column 6, lines 39-42).

Wang et al. was cited as teaching "etching the substrate from the first side and the second side to singulate the dice". However in Wang et al., etching is performed by forming front side dicing trenches 150 (Figure 1) in layers 115, 125, 135, 145 (column 2, lines 63-67), forming a resist 180 (Figure 4) on the back side of the wafer, and then etching backside dicing trenches 190 (Figure 5) to separate the devices 100, 200 (column 4, lines 21-32).

The present method is simpler than Wang et al. because only a single etching step is required. In addition, the polymer layer 36E (Figure 13C) serves the dual purpose of an etch mask during the etching step, and a protective layer in the completed component 16E (Figure 13F). Applicant submits that the additional recitations patentably distinguish the claimed method from the combination of Shinogi et al. and Wang et al., which is the basis of all the 35 USC §103 rejections.

Dependent claim 118 has been amended to recite another limitation which further distinguishes the claimed method from the art. In particular amended claim 118 recites "the etching step is performed by submerging the substrate in a wet etchant." Antecedent basis for this recitation is contained on page 8-15 of the specification.

2. No incentive to combine references

For a prima facie case of obviousness under 35 USC §103(a), MPEP 2142 requires that there must be some incentive in the references or the prior art for the proposed combination. Applicant submits that one skilled in the art at the time of the invention would have no incentive to combine Shinogi et al. and Wang et al. in the manner of the Office Action.

As support for the combination of Shinogi et al. and Wang et al. the Office Action states: "Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the mask and etching of Wang with the method of Shinogi in order to provide easy separation and alignment of the chips from the wafer during singulation".

However, the Shinogi et al. method of sawing grooves 21 and then back grinding provides separation of the chips 20A, such that there would be no reason to substitute etching steps. In formulating the proposed combination of references the Examiner is requested to use the view point of one skilled in the art at the time of the present invention, but without the benefit of the present disclosure.

35 USC §103 Rejections of Claims 129-141

Claims 129-141 are directed to a method for fabricating semiconductor components 16-1X (Figure 15F) or 16-1XHS (Figure 16).

As shown in Figure 15A, the method includes the step of providing a plurality of semiconductor dice 14-1X having die contacts 18-1X on a substrate 12-1X. As shown in Figure 15B, the method also includes the step of forming contact bumps 24-1X on the die contacts 18-1X. As shown in Figure 15C, the method also includes the step of forming a circuit side polymer layer 36P-1X, and planarizing the contact bumps 24-1X. As shown in Figure 15D, the method also includes the step of thinning the substrate 12-1X. As shown in Figure 15E, the method also includes the step of forming terminal contacts 42-1X on the contact bumps 24-1X. As shown in Figure 15F, the method also includes the step of singulating the dice 14T-1X from the substrate 12T-1X.

As shown in Figure 15E, the method can also include the step of attaching a back side coat tape 100-1X to the thinned substrate 14T-1X, which can be laser marked (Figure

15G). As shown in Figure 16, the method can also include the step of attaching a heat sink 65-1X to the thinned substrate 14T-1X.

Independent claims 129 and 137 have been amended to recite the step of "forming a first polymer dam on the first side of the substrate configured to encircle at least some of the dice", and the step of "forming a polymer layer on the first side within the first polymer dam." The first polymer dam is the good die dam 32P-1X shown in Figure 15C. Antecedent basis for the "encircle at least some of the dice" recitation is contained on page 19, lines 30-31 of the specification. Antecedent basis for the "forming the polymer layer within the first dam" recitation is contained on page 21, lines 21-24 of the specification.

Amended independent claims 129 and 137 also recites the step of "forming a second polymer dam on the first side configured to support peripheral areas of the substrate". The second dam is the support dam 34P-1X shown in Figure 15C. Antecedent basis for the "configured to support peripheral areas" recitation is contained on page 21, lines 1-3 of the specification. The support dam 34P-1X supports the substrate 14T-1X during the thinning step and helps to prevent cracks from developing.

The additional steps of forming a first dam for the polymer layer, and forming a support dam for the thinning step are not disclosed or suggested by the prior art. Accordingly claims 129-136 are submitted to be unobvious over Shinogi et al. and Wang et al. Similarly claims 137-141 are submitted to be unobvious over Shinogi et al. and Chein.

Dependent claim 135 has been amended to state that "the first polymer dam encircles only the complete dice on the substrate." Antecedent basis for this recitation is contained on page 19, lines 29-31 of the specification.

Conclusion

In view of the amendments and arguments, favorable consideration and allowance of claims 114-151 is requested. Should any issues remain, the Examiner is requested to contact the undersigned by telephone.

DATED this 30th of December, 2004.

Respectfully submitted:



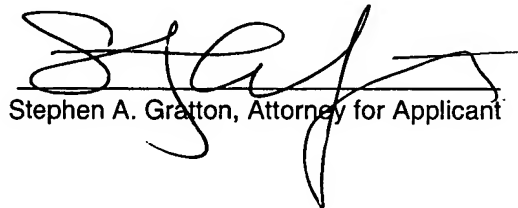
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